
W91321-04-C-0023

LOGANEnergy Corp.

# US State Department PEM Demonstration Project

Proton Exchange Membrane (PEM) Fuel Cell Demonstration
Of Domestically Produced PEM Fuel Cells in Military Facilities

US Army Corps of Engineers
Engineer Research and Development Center
Construction Engineering Research Laboratory
Broad Agency Announcement CERL-BAA-FY03

US Embassy residence in London, UK

Sept 1, 2005

## Executive Summary

Under terms of its FY'03 DOD PEM Demonstration Contract with ERDC/CERL, LOGANEnergy will install and operate a Plug Power GenSys 5kWe Combined Heat and Power fuel cell power plant at the US Embassy residence in London, UK. The multi-unit facility provides resident quarters for US embassy staff and families on assignment in London. The unit will be sited within the ground level parking deck adjacent to the mechanical room. The unit will be electrically configured to provide grid parallel/grid independent service to the facility. The fuel cell installation will also provide up to 8,000 Btu/h to the facility's hot water system. LOGAN has hired Southern Electrical Contracting (SEC) to provide installation services. SEC is a subsidiary of Scottish and Southern Energy, PLC, the UK's largest utility services provider. Two SEC employees will receive PEM service and maintenance training in the US to enable them to provide product support during the demonstration period. It is anticipated that the project will add $46.10 in energy costs to the facility during the period of performance.

The POC for this project is Geoff Miller, US Embassy facilities maintenance manager, whose coordinates are:

MillerGE@state.gov

Telephone 44-207-894-0246

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**Proposal – Proton Exchange Membrane (PEM) Fuel Cell Demonstration of Domestically Produced Residential PEM Fuel Cells in Military Facilities**

## 1.0 Descriptive Title

LOGANEnergy Corp. Small Scale PEM 2004 Demonstration at DOS US Embassy Residence, London, UK.

## 2.0 Name, Address and Related Company Information

LOGANEnergy Corporation

1080 Holcomb Bridge Road
BLDG 100- 175
Roswell, GA 30076
(770) 650- 6388

DUNS 01-562-6211
CAGE Code 09QC3
TIN 58-2292769

LOGANEnergy Corporation is a private Fuel Cell Energy Services company founded in 1994. LOGAN specializes in planning, developing, and maintaining fuel cell projects. In addition, the company works closely with manufacturers to implement their product commercialization strategies. Over the past decade, LOGAN has analyzed hundreds of fuel cell applications. The company has acquired technical skills and expertise by designing, installing and operating over 30 commercial and small-scale fuel cell projects totaling over 7 megawatts of power. These services have been provided to the Department of Defense, fuel cell manufacturers, utilities, and other commercial customers. Presently, LOGAN supports 30 PAFC and PEM fuel cell projects at 21 locations in 12 states, and has agreements to install 22 new projects in the US and the UK over the next 18 months.

## 3.0 Production Capability of the Manufacturer

Plug Power manufactures a line of PEM fuel cell products at its production facility in Latham, NY. The facility produces three lines of PEM products including the 5kW GenSys5C natural gas unit, the GenSys5P LP Gas unit, and the GenCor 5kW standby power system. The current facility has the capability of manufacturing 10,000 units annually. Plug will support this project by providing remote monitoring, telephonic field support, overnight parts supply, and customer support. These services are intended to enhance the reliability and performance of the unit and achieve the highest possible customer satisfaction. Scott Wilshire is the Plug Power point of contact for this project. His phone number is 518.782.7700 ex1338, and his email address is scott_wilshire@plugpower.com.

4.0 Principal Investigator(s)

Name Samuel Logan, Jr. Keith Spitznagel
Title President Vice President Market Engagement
Company Logan Energy Corp. Logan Energy Corp.
Phone 770.650.6388 x 101 860.210.8050
Fax 770.650.7317 770.650.7317
Email samlogan@loganenergy.com kspitznagel@loganenergy.com

5.0 Authorized Negotiator(s)

Name Samuel Logan, Jr. Keith Spitznagel
Title President Vice President Market Engagement
Company Logan Energy Corp. Logan Energy Corp.
Phone 770.650.6388 x 101 860.210.8050
Fax 770.650.7317 770.650.7317
Email samlogan@loganenergy.com kspitznagel@loganenergy.com

6.0 Past Relevant Performance Information

Contract: PC25 Fuel Cell Service and Maintenance Contract #X1237022
Merck & Company
Ms. Stephanie Chapman
Merck & Company
Bldg 53 Northside
Linden Ave. Gate
Linden, NJ 07036
(732) 594-1686

Contract: Four-year PC25 PM Services Maintenance Agreement.
In November 2002 Merck & Company issued a four-year contract to LOGAN to provide fuel cell service, maintenance and operational support for one PC25C fuel cell installed at their Rahway, NJ plant. During the contract period the power plant has operated at 94% availability.

Contract: Plug Power Service and Maintenance Agreement to support one 5kWe GenSys 5C and one 5kWe GenSys 5P PEM power plant at NAS Patuxant River, MD. .

Plug Power
Mr. Scott Wilshire.
968 Albany Shaker Rd.
Latham, NY 12110
(518) 782-7700 ex 1338

LOGAN performed the start-up of both units after Southern Maryland Electric Cooperative completed most of the installation work and continues to provide service and maintenance during the period of performance.

Contract: A Partners LLC Commercial Fuel Cell Project Design, Installation and 5-year service and maintenance agreement.
Contract # A Partners LLC, 12/31/01

Mr. Ron Allison
A Partner LLC
1171 Fulton Mall
Fresno, CA 93721
(559) 233-3262

On April 20, 2004 LOGAN completed the installation of a 600kWe PC25C CHP fuel cell installation in Fresno, CA.

## 6.0 Host Facility Information


The US Embassy Residence in London, is home to over 50 US London Embassy staff and family members. The building is located next door to the historic Abby road recording studio that produced many of the Beatles 1970s recordings. This facility was selected to host the UK PEM demonstration project from a selection of four potential sites that were suggested by Geoff Miller, US Embassy facilities manager, for the following reasons; (a) it provides an accessible location where the PEM unit may be easily sited, (b) natural gas is conveniently located at the building, (c) the facility has a continuous thermal load that will optimize the fuel cell's thermal output, (d) fuel cell integration with the facility's existing energy services do not require costly modifications, and (e) Embassy facilities staff are highly supportive of the project.

LOGAN has enlisted the support of Scottish and Southern Utility (S&S) to take the lead in procuring local support for the project to insure timely submission and process of all permits that may be required to install and operate the PEM fuel cell.

The Oversees Building Office (OBO) of the Department of State located in Arlington, VA operates the US Embassy Residence in London property. LOGAN has worked diligently over the past year to win the support of OBO to proceed with the project. At this point it appears that approval will be granted within two weeks.

## 8.0 Fuel Cell Site Information

The photo at right shows the fuel cell pad site location within the parking garage of the US Embassy residence in London facility. A Plug Power 100VAC 50Hz GenSys 5C PEM 5kW fuel cell will provide power for the demonstration project. The site is convenient to electrical, mechanical and thermal connections located in a utility room entered by the white door seen in the photo at right. A six-foot fence will enclose the fuel cell pad area to provide site security during the test period, and the area be restored to its original condition afterward. LOGAN will have the able assistance and representation of both SEC Contractors and S&S Utility to insure that the project adheres to local codes and standards, and that it has all of the requisite permits prior to construction and operation of the fuel cell site.

## 9.0 Electrical System

The Plug Power GenSys 5C PEM fuel cell power plant provides both gird parallel and grid independent operating configurations for site power management. This capability is an important milestone in the development of the GenSys5 product and for the PEM Program itself, as it is a significant developmental step on the pathway to product commercialization. The natural gas unit selected for this project will have a power output of 100 VAC at 50 Hz in order to match the actual operating conditions at the UK site. This will be accomplished by making setpoint adjustments to the MP-5 inverter controller software to convert it to a 50 Hz machine from the normal 60 Hz system typical of US installations. The fuel cell will be interconnected with the grid at a new 100-amp circuit breaker to be installed in the facility's existing electric service panel. A new emergency panel will be placed adjacent to the existing service panel and will have several non-critical circuits attached to simulate the fuel cell's stand-by power application.

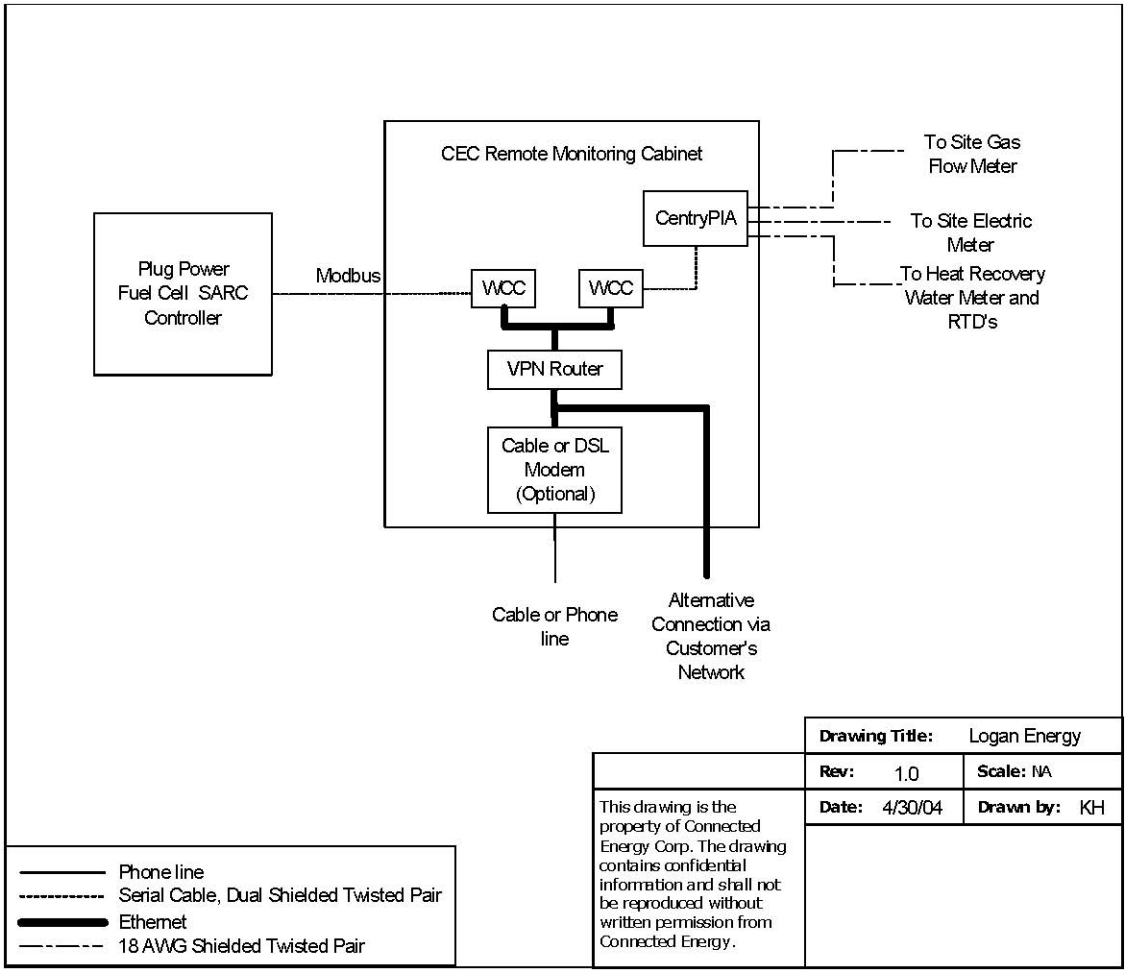
## 10.0 Thermal Recovery System

LOGAN intends to capture fuel cell waste heat and transfer it into the facility's hot water supply system pictured in the photo at left. A small commercial heat exchanger will be installed at the cold water feed to the hot water tanks allowing the fuel cell to reject its heat into the domestic hot water system. While operating at a set point of 2.5 kWh, the fuel cell will provide 7800 Btuh at approximately 140 degrees F to the storage tank.

## 11.0 Data Acquisition System

LOGAN proposes to install a Connected Energy Corporation web based SCADA system that provides real time monitoring of the power plant. The schematic drawing seen below describes the architecture of the CEC hardware that will support the project. The system provides a comprehensive data acquisition solution and also incorporates remote control, alarming, notification, and reporting functions. The system will pick up and display a number of fuel cell operating parameters on functional display screens including kWh, cell stack voltage, and water management, as well as external instrumentation inputs including Btus, fuel flow, and thermal loop temperatures. CEC's Operations Control Center in Rochester, New York, collects, stores, displays, alarms, archives site data, and maintains connectivity by means of a Virtual Private Network that will link the fuel cell to CEC's control center. A direct link to the site will be furnished to the UK Embassy staff and OBO.

CEC WEB enabled SCADA terminal hardware.



12.0 Economic Analysis

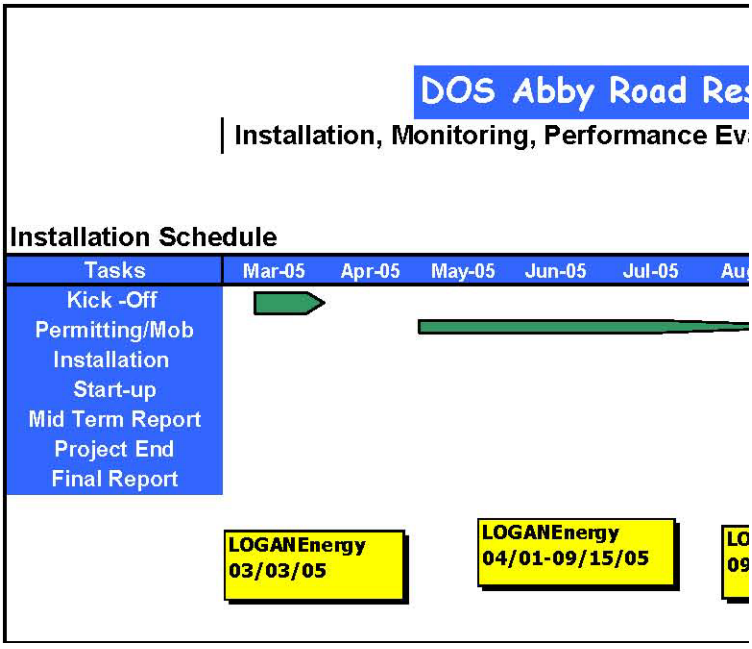
| | | | | | |
|---|---|---|---|---|---|
| Total | | | | **$** | **142,250.00** |
| **Assume Five Year Simple Payback** | | | | $ | 28,450.00 |
| **Forcast Operating Expenses** | Volume | | $/Hr | | $/ Yr |
| Natural Gas Mcf/ hr @ 2.5kW | 0.0330 | $ | 0.22 | $ | 1,704.13 |
| Water Gallons per Year | 14,016 | | | $ | 11.91 |
| Total Annual Operating Cost | | | | | |
| **Economic Summary** | | | | | |
| Forcast Annual kWH | | | 19710 | | |
| Annual Cost of Operating Power Plant | | $ | 0.087 | kWH | |
| Credit Annual Thermal Recovery Rate | | | ($0.020) | kWH | |

13.0 Kickoff Meeting Information

The project kick-off meeting occurred on March 3, 2005 at 10:00 at the US Embassy building in London, UK. Those in attendance were Jerry Pifer and Geoff Miller representing the Embassy, Tony Harris of SEC Contractors, Garth Graham from Scottish and Southern Utility PLC, Dr. Mike Binder, representing CERL, and Sam Logan representing LOGANEnergy. The meeting covered the scope of the project including the design, mobilization and installation tasks with particular attention to the permitting process. Following the meeting the attendees traveled to the site to inspect the installation location and review other site issues. The meeting concluded with a plan to go forward with the permitting process under the guidance of Garth Graham, which should take about 6 months to complete.

14.0 Status/Timeline

Please see Appendix 1 below.


DOS Abby Road Res
Installation, Monitoring, Performance Ev
Installation Schedule
Tasks
Mar-05
Apr-05
May-05
Jun-05
Jul-05
Kick -Off
Permitting/Mob
Installation
Start-up
Mid Term Report
Project End
Final Report
LOGANEnergy
03/03/05
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04/01-09/15/05

Appendix 1